iMOST (instant Mobile Self-Test)
-- Intelligent Nanostructures Enabling Accurate, Broad, Instant, Mobile Health Self-Test

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Lab tests are crucial in the diagnostics and healthcare ecosystem. Most traditional tests are conducted in centralized labs, which are inconvenient for patients and require complex machines, professional operation, and a laboratory environment, leading to a turnaround time of several hours or days. However, this is necessary to ensure accuracy because (1) inaccurate results could have disastrous consequences, and (2) traditional biochemistry demands precision in the sample, reagent, machine, and operation. There is a critical unmet need for a new test platform that can be performed anywhere, by anyone, including patient self-administration, at any time. The platform should produce accurate and instant test results (within ~60 seconds), use one device format for a broad test menu and various sample types, and be easy to use, affordable, portable, and scalable to tens of millions of units. Developing such a platform has been a longstanding dream, and have drawn enormous efforts. However, these efforts have been seriously hampered by several barriers. One barrier is that in a traditional test the result becomes inaccurate when the testing is under imperfect conditions and/or using a simple instrument. Another is the difficulty in easily and quickly preparing a broad range of sample types and allowing a test to be fast.

The talk will present a new test platform: iMOST™ (instant Mobile Self-Test), which uniquely uses intelligent nanostructures to achieve rapid sample preparation and enable accurate, instant, simple, low-cost, mobile health self-tests, hence overcoming the above major barriers and offering a solution to the unmet needs. iMOST was created by the author using many unconventional approaches fundamentally different from traditional lab-tests and utilizing his nearly four decades of multidisciplinary research. iMOST offers laboratory-accuracy tests even in imperfect conditions and using a simple instrument (i.e., iMOS is fault-tolerant). Particularly, iMOST uses intelligent nanostructures - nano-enabled artificial intelligence and machine learning (NEAM), computational imaging, and advanced biochemistry. Furthermore, iMOST uses intelligent nanostructures to prepare a sample, allowing one-sample card format and one reader to easily and quickly prepare and test different sample types (blood, urine, saliva, sweat, tissue, breath, etc.), different biomarker types (cells, proteins, small molecules, and nucleic acids), and different assay types (cytology, immunoassay, colorimetric, hybridization assay, and pathology). Finally, the intelligent nanostructures also drastically reduce machine learning model size and computation time, and enable a reader built on a smartphone (or alike) and smartphone lenses, making the reader small (as small as pocket size), light, low-power-consumption, and low cost (easy to manufacture into tens of millions of units or more).

* The author is the Founder of Essenlix, who performed and led the iMOST work at Essenlix together with members of Essenlix.

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